A COST ANALYSIS OF SPACE AVAILABLE TRAVEL

GRADUATE RESEARCH PROJECT

Karen P. Rupp, Major, USAF

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Karen P. Rupp

Major, USAF

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Karen P. Rupp
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Approved:

________//signed// ______________________________ _13 May 14__
Joshua K. Strakos, Maj, USAF (Advisor) Date

Abstract

The intent of this research was to determine the cost of Space Available travel to the government. Since the early 1970's, Congressional reports, studies and audits have highlighted the recommendations to charge Space Available passengers a fee to recoup some of the money the government spends on the program. In 1999, an AFIT thesis documented that the government spent approximately $30 million on processing and transporting Space Available passengers in FY97 and FY98. However, due to different methodologies applied, it is believed that this paper presents a more accurate cost analysis of the Space Available program.

This research calculated the manpower and fuel costs required to process and transport Space Available passengers. A time study was conducted to obtain the time required of a passenger service agent to process a passenger through the passenger terminal. Regression equations were applied for the five most commonly used organic airlift used for Space Available travel to obtain the fuel costs. Once those costs were calculated, an overall Space Available program cost was determined as well as a cost per passenger and a cost per bag.

Overall, the government spends approximately $2.6 million annually to operate the Space Available program. This cost is not programmed in the annual budget as DODi 4515.13 states that no (or negligible) additional funds shall be used to support this program. Therefore, these funds are taken from other programs. This research recommends instituting a fee, either per passenger or per bag, to help recoup some of the monies expended as we move forward in a budget constrained environment.

To my amazing husband and four children,thank you for your love and support.

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Maj Karen P. Rupp

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I. Introduction

Background

Over the last two years, budget cuts have affected many programs in the Department of Defense (DOD). From the acquisition of new aircraft to tuition assistance and personnel, almost every aspect of the military has been impacted. Due to the increasing national deficit and the drawdown in Iraq and Afghanistan, Congress mandated a 20-percent reduction in spending (between $350 billion and $950 billion) over the next 10 years. Sequestration alone has cut approximately $52 billion from the 2014 defense budget and the cuts will continue through 2019. Due to these large cuts and in order to continue to be the best military in the world, the services must analyze every program for cost savings.

Thus far, force strength and aircraft acquisitions have received the majority of the budget cuts. Yet, there is talk of revamping the military retirement program and increasing the costs of Tricare to the military member and their family. It seems that almost every program is susceptible to cuts in order to meet Congress' mandate. However, the Space Available (Space-A) program continues without interruption. It is the researcher's belief that the costs of the Space-A program are unknown and therefore it remains unaffected. While it's not the researcher's intention to discontinue the Space-A program, a cost analysis may provide a starting point for leadership to examine better ways to do business.

According to DODi 4515.13, Space-A travel is defined as a “privilege (not an entitlement) that accrues to Uniformed Services members as an avenue of respite from the rigors of Uniformed Services duty” (p. 76). This program allows authorized passengers to occupy aircraft seats that are surplus after all space-required (Space-R) passengers have been accommodated. Space-R passengers are those passengers traveling on official orders. Space-A passengers are considered United States military personnel, reservists, retirees, DOD civilians (under certain circumstances) and family members of these groups. An important aspect of this program is that “no (or negligible) additional funds shall be expended and no additional flying hours shall be scheduled to support this program.” (4515.13-R, p. 76) A 1999 study has suggested that Air Mobility Command (AMC) spends millions of dollars annually to keep this program operational, although much has changed since that cost assessment, to include operations tempo and fuel costs (Long, 1999).

In 2012, according to AMC, 895,101 passengers were moved on AMC owned or contracted airlift. Of those, 21% (191,288) were Space-A passengers. In 2012, the Government Accountability Office (GAO) completed a review of DOD’s Space-A travel program to determine the effects that an increase in eligible travelers may have on the usage of the Space-A program. (GAO, 2012). While this study researched the effects on air terminal logistics and maintenance, it failed to look at the costs associated with such an increase. This research paper will analyze the costs of fuel and manpower that DOD spends on the Space-A program. It also provides a list of options for senior leaders to recoup some of the monies expended on the Space-A program as we move forward in a budget constrained environment.

Research Focus

This research used Fiscal Year (FY) 11 and FY12 historical data to identify the costs that Air Mobility Command (AMC) expends on Space-A travel. It analyzed the costs of fuel to support the additional weight of the Space-A passengers and baggage. It also identified the manpower costs required to support the movement of Space-A passengers on AMC owned or contracted aircraft. Once these costs were calculated, options were presented in Chapter 5 to assess a fee to Space-A passengers for travel, in an attempt to alleviate some of the budget pressures on AMC.

Research Objective/Research Questions

The primary goal of this research was to determine the costs for each passenger that travels Space-A on AMC owned or contracted airlift. The overarching research question was: How much does it cost AMC when a passenger travels Space-A? The following investigative questions were addressed:

1. How many passengers traveled Space-A in 2011? In 2012?
2. What were the weights of the Space-A passengers that traveled in 2011? In 2012?
3. What were the baggage weights for the Space-A passengers that traveled in 2011? In 2012?
4. What are the manpower costs to process a Space-A passenger?

5. What are the fuel costs to transport a Space-A passenger and their bag(s)?

Once this data was captured and analyzed, the following questions were answered:

1. What is the total cost of the Space-A program?
2. What are the Space-A per passenger costs?
3. What are the Space-A per baggage costs?

Methodology

This research used the historical data of Space-A travel from the Global Air Transportation Execution System (GATES) and the Global Transportation Network (GTN). AMC/A4 (Air Transportation division) provided the Space-A data for 2011 and 2012. The requested data was as follows: date, aircraft type, mission number, space available passenger data to include passenger and baggage weight, aerial port of embarkation and aerial port of debarkation.

Once the data was gathered, a cost of weight regression model provided by AMC/A9 (Analysis, Assessments and Lessons Learned division) was applied to obtain the additional fuel required to carry incremental weight, such as passengers and baggage. This additional fuel was then be multiplied by the then-year cost of fuel to capture the costs of moving those passengers and baggage.

To obtain the manpower costs, a time study was conducted at Joint Base McGuire Dix Lakehurst (JB MDL) passenger terminal to determine the length of time it requires to process a Space-A passenger. This study was a direct and continuous observation of aerial port personnel processing Space-A passengers, using a stop watch to record the time taken to accomplish this task. This study did not collect personal identifiers or specific demographic information. The times for each passenger observed were averaged to provide the overall processing time. That time was then multiplied by the AMC/A1 (Manpower division) costs of an Airman to compute the manpower costs associated with processing Space-A passengers. Of important note, no personally identifiable information was collected and neither the passenger nor the Airman processing the passenger was the subject of this investigation.

Due to federal research guidelines, an exemption request based on the Code of Federal Regulations, title 32, part 219, section 101 was submitted to the AFIT Institution Review Board. The AFIT IRB Exemption Determination Official approved the exemption since sensitive data, which could reasonably damage the subjects' financial standing, employability, or reputation was not gathered. Furthermore, demographic data that would identify a specific subject was not collected.

Assumptions/Limitations

This research assumes that the DOD will make budget cuts of $350 to $950 billion over the next 10 years. It also assumes that due to Space-R requirements, AMC owned and contracted passenger terminals will remain open. Finally, this research uses historical data and does not predict any increases or decreases of Space-A travel usage in the future.

The main limitation with this research lies in the data collection. As with any type of data collection, the data received from IT systems is only as good as the information that is entered into the system. This research assumes that all the data entered into the system is accurate and correct and is considered true data. While the data came from the GATES and GTN historical files, there are several tools that are used to query the files and the results are somewhat dependent on the method and query used to pull the data. Therefore, the comparison of what should be similar data may not match exactly. However, this research assumes that despite querying the data from multiple systems, all will produce similar results. This research only focuses on Fiscal Years (FY) 2011 and 2012 since prior year data wouldn't necessarily capture the data requested due to system changes and upgrades over the years but it assumed that this data accurately reflects the general program costs for Space-A travel. Finally, the researcher acknowledges that infrastructure and equipment costs are also cost variables when calculating the Space-A travel program costs. However, since Space-A passengers are typically processed with Space-R passengers it would be difficult to distinguish the costs of building space, electricity, heating and cooling between Space-R passengers and Space-A passengers. The same reasoning applies to equipment support such as forklifts and baggage conveyors. Therefore, the researcher has opted to not include these costs in the overall cost assessment as they would be difficult to obtain and the assumption is that the individual costs are negligible and therefore won't have a significant effect on overall program costs.

Implications

In a fiscally constrained environment, it is imperative that every program is analyzed to determine how much it costs the government to operate. This research provides senior leaders detailed information on the costs of the Space-A program so they may make informed decisions regarding the future of the program. It can also assist

AMC/A4T personnel in answering Congressional inquiries on the Space-A program. Recently, bills have been introduced in Congress to expand the Space-A travel program to potentially include international travel to reservists who are entitled to retirement pay at age 60 and their dependents, international travel for reservists and their dependents and widows and widowers of active duty personnel and reservists and their dependents. (GAO, 2012) Ultimately, this research will determine the ‘price tag’ of this privilege and can be used to calculate the costs if the Space-A program expands as discussed in the GAO study.

II. Literature Review

Chapter Overview

Most of the literature regarding Space-A travel is found in Congressional reports, studies and audits. Over the years, the reports and audits have highlighted suspected abuses and mismanagement of the Space-A program and demands for corrective action. The one common message throughout all the literature is the recommendation to charge Space-A passengers a fee to recoup some of the money the government spends on the program. The studies, reports and findings are detailed in the following paragraphs.

House Appropriations Committee, 1974

In the FY74 House Appropriations Committee Report, number 93-662, the committee indicated that in prior years' hearings they became generally aware of a large increase in the use of Space-A travel. To determine the extent of the increase, they directed their Surveys and Investigations Staff to review Military Airlift Command's (MAC, which is now Air Mobility Command) procedures for providing this practice. The investigation report pointed out many deficiencies which led the committee to believe that "MAC has turned this privilege into a requirement to provide free transportation at Government expense to anyone eligible who desires to travel by air to the points served by MAC." (House of Representatives, 1974)

The committee provided some historical data to provide additional insight into what they believed to be abuses in the Space-A program. They indicated that in FY66, 153,529 Space-A passengers were moved on Military Airlift Command owned or operated aircraft. What caused the committee's increased interest and concern was that in FY72, records show a total of 336,229 Space-A passengers traveled on MAC owned or operated aircraft, an increase of 199 percent. In addition, the following totals were provided for originating Space-A travel aboard MAC international channel routes for the period FY68 – FY72:

Table 1: International Space-A Passengers (House of Representatives, 1974)

Period	Passengers	Military Aircraft	Commercial Aircraft
FY68 - FY 72	1,682,550	734,128	948,422

At the time of the report, most commercial flights were configured to carry approximately 165 passengers, and the committee noted that movement of the 948,422 Space-A travelers on these flights would have required 5,748 commercially chartered aircraft. (House of Representatives, 1974) It was the opinion of the committee that the Space-A travel program had evolved into an informal requirement for MAC to provide on-demand airlift to Space-A travelers entirely at the government's expense.

The committee was also concerned that MAC had been allowed to establish passenger terminals at aerial ports which were designated solely for cargo missions. They provided an example of Dover AFB, Delaware, where all scheduled channel flights were cargo missions. However, during FY71 and FY72, there were a total of 159,086 passengers who arrived and/or departed this base, and over 99 percent of the passengers were traveling on a Space-A basis. (House of Representatives, 1974) They stated that the Air Force cannot estimate the total cost involved in processing, transporting, and caring for the excess number of persons being granted this free Space-A transportation.

The Committee believed it was costing the government millions of dollars a year to provide this 'fringe benefit'. They stated that this practice must be curtailed and the cost of transportation brought in line with providing combat readiness of the armed forces. They further stated that the establishment of a special reservation system for senior military officers, the establishment of Distinguished Visitor (DV) lounges, providing free on- and off-base transportation and on-base transient quarters were additional indications of abuses which have become a part of the system that cannot be condoned and must be discontinued. (House of Representatives, 1974)

The committee stated these practices were clear signs of Space-A travel abuse and subsequently directed the Secretary of Defense to discontinue the practice of providing military aircraft and the purchasing of excess commercial airlift for the purposes of Space-A travel. Military aircraft and purchased commercial aircraft would only be provided for the combat readiness of the armed forces. Then, if any space was available, it would be offered to those on emergency leave and then active duty service members on a first come – first served basis. Additionally, they recommended the discontinuation of allowing retirees to fly Space-A. Finally, they recommended that the Secretary consider whether those obtaining free travel, other than those on emergency leave, should be required to pay a prorata share of the cost of obtaining this transportation. (House of Representatives, 1974)

To enforce tighter controls over the use of airlift service, the Committee reduced the request of the Military Departments for Space-A transportation funding for FY74 by $25 million. These reductions, by service, were $10 million from the Army; $10 million from the Air Force and $5 million from the Navy. However, the Senate did not agree with the large cuts and therefore restored half of the projected cuts back to the services. When the bill was finally passed, the Services budgets were cut a total of $12.5 million for Space-A transportation. Aside from the Space-A abuses, the House Committee also cited the energy crisis as one of the reasons for the curtailment. They indicated that precious fuel should be saved for higher priority tasks rather than used for marginal Space-A travel. (House of Representatives, 1974)

General Accounting Office (GAO) Report, 1977

While the House Appropriations Committee in 1974 suggested the curtailment of Space-A travel, the 95th Congress learned through a Government Accounting Office (GAO) report that efforts to reduce Space-A travel had not been successful. In fact, it showed that in FY68, Space-A travelers accounted for 9 percent of the total passengers and in FY75, the total Space-A travelers rose to 24 percent.

Table 2: Space-A Travel Percentages for FY68 through FY76, 1st Quarter (GAO, 1977)

FY	Total Passengers Airlifted	On MAC Controlled Aircraft	On Other Defense Controlled Aircraft	Percent of Total Passengers
1968	2,978,000	278,000	N/A	9
1969	3,256,000	336,000	N/A	10
1970	3,263,000	373,000	N/A	11
1971	2,906,000	360,000	N/A	12
1972	2,243,000	336,000	N/A	15
1973	1,721,000	310,000	N/A	18
1974	1,438,000	286,000	N/A	20
1975	1,883,000	305,000	155,000	24
1976	472,000	66,000	34,000	21
Total	**20,160,000**	**2,650,000**	**189,000**	**14**

While the report did not attempt to identify incremental costs involved in processing Space-A passengers, it did estimate the average cost to process a passenger at a military air terminal was $17.00. Based on this cost, they estimated that the cost to the government to handle 460,000 passengers (MAC controlled and other defense controlled aircraft) in FY75 was $7.8 million. Additionally, the Airport and Airway Revenue Act of 1970 directed the Air Force to pay a $3 tax for each passenger departing the United States on commercial aircraft. The report estimated that the total payments since 1970 to the time of the report in 1977, for passengers not on official business, amounted to $850,000. (GAO, 1977) However, no attempt was ever made to have the Space-A passengers reimburse the Air Force for this expenditure.

In a draft report, the GAO recommended that DOD consider collecting a $17 service charge for terminal processing as well as the $3 tax from those travelers. The Assistant Secretary of Defense (Comptroller) agreed to collect the $3 tax however he disagreed with the recommendation to collect a service charge for terminal processing. His position was that no additional costs over those needed to process official duty passengers should be incurred for the handling of Space-A passengers. (GAO, 1977) He reasoned that that the terminals are only staffed to accommodate Space-R passengers and therefore there should be no additional costs to the government to process Space-A passengers. The GAO disagreed and showed that during a 3-month period at Dover AFB, 44 passenger processing personnel handled 3,650 passengers, of which 999 (38 percent) were Space-R passengers and 1,660 (62 percent) were Space-A passengers. They stated that taking away the Space-A workload leaves the highly questionable practice of keeping a passenger terminal open 24 hours a day, 7 days a week, to accommodate an average of 11 Space-R passengers a day. (GAO, 1977) It was their belief that an in-depth manning study would result in a reduction of terminal processing spaces and necessitate a curtailment of Space-A travel. They therefore recommended that the DOD reconsider assessing a nominal processing charge to assure the continuation of Space-A travel benefits without adding to the government's costs.

House Appropriations Committee, 1977

In June 1977, the House Committee on Appropriations considered establishing $20 as the Space-A fee, which would represent the average cost to process all MAC passengers plus the $3 head tax. After careful consideration, the Committee recommended that the Space-A charge should be established at $10 for each terminal that a Space-A passenger passes through. (DOD/IG, 1991) MAC began charging a $10 fee in 1978.

Department of Defense Inspector General (DOD/IG) Audit Report, 1991

Approximately 11 years after the implementation of the $10 fee to Space-A travelers, the DOD/IG conducted an audit to determine whether DOD was recovering the cost to process and transport Space-A passengers on DOD controlled aircraft. Additionally, it sought to evaluate if the internal control procedures over cash collection of fees were adequate. The audit took place from December 1989 through June 1990, evaluating FY89 Space-A passenger data. The result of this audit was the disclosure that DOD wasn't collecting sufficient costs to recover the expenditures for Space-A travel and that the collection process itself was extremely flawed. (DOD/IG, 1991)

The audit revealed that it cost DOD approximately $24.2 million to process and transport 766,800 Space-A passengers in FY89. Of this amount, about $4.6 million was recovered in fees from Space-A passengers resulting in DOD paying the remaining $19.6 million. (DOD/IG, 1991) This primarily occurred because the Space-A fee of $10 was insufficient to recover DOD's costs. The audit examined two areas of costs associated with transporting Space-A passengers aboard DOD owned or controlled aircraft: the passenger processing cost and the fuel cost. Overall, in order to fully recover the incurred costs, they estimated that DOD would have had to charge every Space-A passenger $32 for travel.

When calculating the average cost to process a passenger, the GAO analyzed the costs at 13 MAC passenger terminals. The costs included staffing and terminal operation costs such as heat, light, power, custodial, maintenance services, and contract support. Based on their calculations, the average cost to process a passenger (Space-A or Space-R) was $24.70. The terminals and costs that were included are listed below:

Table 3: Passenger Processing Costs (DOD/IG, 1991)

Location	Total Originating Passengers	Cost of Terminal Operation	Cost to Process and Originating Passenger
Dover AFB, DE	44,159	1,130,968	25.61
McGuire AFB, NJ	22,536	1,498,012	66.47
Charleston AFB, SC	35,712	1,317,790	36.90
Norton AFB, CA	88,476	1,723,605	19.48
Travis AFB, CA	59,640	1,851,310	31.04
Hickam AFB, HI	78,484	3,306,855	42.13
Andersen AFB, GU	37,941	794,800	20.95
Rhein Main AB, GE	207,961	3,463,000	16.65
Philadelphia IAP, PA	89,571	2,425,882	27.08
Charleston IAP, SC	57,564	919,078	15.97
Los Angeles IAP, CA	43,319	883,894	18.29
Oakland IAP, CA	19,689	1,233,751	62.66
Lambert IAP, MO	81,503	981,933	12.05
Total	**866,555**	**$21,530,878**	**$24.70 (average)**

The audit examined FY89 station handling reports and estimated that approximately 766,800 Space-A passengers moved on MAC owned or controlled aircraft. Using the average cost to process a passenger ($24.70) to the number of Space-A passengers moved, they determined that it cost DOD approximately $19 million to process the Space-A passengers. Of this total, 310,600 (40 percent) did not pay a fee or fees collected were not deposited.

One of the reasons for the loss of revenue was that MAC Regulation 76-1 exempted approximately 143,500 Space-A passengers since they originated through terminals that had an annual total of less than 1,000 international and intratheater Space-A passengers. (DOD/IG, 1991) MAC officials stated that fees were not collected at these terminals because the insignificant number of Space-A passengers didn't warrant the administrative effort. In FY89, there were 41 terminals that met this exemption criteria and as a result, 36,500 Space-A passengers were not charged the $10 Space-A fee in FY89.

MAC Regulation 76-1 also exempted Space-A passengers traveling within the Continental United States (CONUS), from paying a Space-A fee. MAC Officials indicated that free Space-A travel within CONUS was considered a benefit that helped to retain members in the Services. The report estimated that approximately 107,000 Space-A passengers traveled within CONUS in FY89 without paying the $10 fee. The GAO closed out that portion of the report by stating that a "review of the congressional record indicated that Congress did not grant any special exemptions to these categories of Space-A passengers." (DOD/IG, 1991)

When calculating the fuel costs, they computed the average fuel cost to transport the weight of a passenger with baggage over the average distance of a MAC flight multiplied by the number of Space-A passengers. (DOD/IG, 1991) They used the average price of JP-4 fuel in FY89 which was $0.61 per gallon to calculate the cost at about $6.84 per passenger in FY89. This cost added to the passenger processing cost led them to recommend a Space-A passenger fee of $32 for travel.

The audit also revealed that MAC did not have internal control procedures to reconcile the number of Space-A passengers processed with the amount of Space-A fees collected or to ensure that fees were deposited in a timely manner. Station handling reports showed that approximately 623,300 Space-A passengers originated from the 45 MAC collecting terminals. However, financial records showed collections for only about 456,100 Space-A passengers. They believed that MAC terminal personnel either collected and did not deposit or did not collect about $1.7 million from approximately 167,100 Space-A passengers from these terminals. (DOD/IG, 1991) Additionally, their review of cash collection vouchers showed that deposits were not made in a timely manner, in accordance with MAC Regulation 76-1. Overall, internal control procedures over cash collection and timely deposit of fees from Space-A passengers were inadequate.

The DOD/IG made several recommendations as a result of their audit. The first was a recommendation that the Assistant Secretary of Defense (Production and Logistics) issue policy guidance authorizing MAC to establish and periodically adjust a fee structure that recovers the cost of processing and transporting all Space-A passengers without exemptions. Second, they recommended that MAC establish, track, and report on a system of internal controls for annual reconciliation of all originating Space-A passengers, as reported on the terminals' station handling reports, to the cash collected. Finally, they recommended that all funds collected for Space-A travel be deposited into the accounts that incurred the costs, with each account receiving a percentage of the revenues approximately equivalent to the percentage of Space-A travel that it funded. (DOD/IG, 1991)

Miscellaneous Correspondence 1991-1993

HQ MAC did not agree with the findings and recommendations in the 1991 DOD/IG report. They disagreed with the cost allocation method used in the audit and stated that only variable costs should be included in the determination of any Space-A fee. Most importantly though, they were reluctant to raise the Space-A fee at all, citing the Army, Navy and Marines were not collecting even the $10 fee. The DOD/IG recommended the fee be increased to $32, which was the first increase in 14 years. Although the fee increase had been mediated down to $15, the Air Force maintained that their image would suffer by charging the new fee. (Long, 1999)

In 1992, the Vice Chief of Staff, General Carns directed that the new $15 Space-A fee be collected at all terminals that were currently collecting the $10 fee. AMC (formerly MAC) disagreed with this fee and requested that the issue be considered by the Joint Chiefs of Staff, primarily to address the issue of the disparity between collection practices of the various services. After much delay and debate, the matter was settled on 19 January 1993 when the Secretary of Defense cancelled the collection of all Space-A fees at all DOD terminals. (Long, 1999)

AFIT Paper, 1999

In 1999, Capt Frank Long published his AFIT thesis, similar to this research paper, on estimating the costs borne by the government for providing Space-A travel. He analyzed two cost categories to estimate funds being expended by the DOD for the purpose of providing Space-A travel. Capt Long estimated the manpower costs by calculating the additional manpower authorizations that result from Space-A movement and estimated the fuel costs to transport a Space-A passenger on a C-5 and C-141 using the planning estimates in AFPAM 10-1403.

It is important to highlight the differences between Capt Long's paper and this one in regards to the methodology and data analysis. The results of his research are significantly different than the results of this research for two reasons. First, Capt Long estimated the manpower costs associated with Space-A travel by analyzing the manpower authorizations. For example, he determined that Space-A accounted for 49 percent of all passenger movement in 1997 and therefore stated that approximately 49 percent of all personnel authorizations were earned, or retained, as a result of Space-A. He then determined the breakdown of the 49 percent by rank and skill level and determined the overall salaries (including basic pay, Basic Allowance for Housing and Basic Allowance of Subsistence) to estimate the total cost per passenger as $17.04. He concluded that all manpower authorizations in excess should be attributed to the overall costs of Space-A. This research paper doesn't examine the manpower authorizations but rather the time necessary to process a Space-A passenger for travel. It is for this reason that the manpower costs in this research are significantly lower than Capt Long's research

Second, he estimated the fuel costs by applying planning estimates outlined in a variety of Air Force Publications. He applied the ratio of passenger weight to the total payload weight to the percentage of the total fuel burned during the flight and used the average flight distance as published in the AMC Command Data Book. He then multiplied that figure with the per-gallon fuel prices to estimate the cost of fuel consumed for transportation. Overall, he estimated the transportation cost for FY 97 as $19.59 per person. This research paper limits the variables used in obtaining the fuel costs by using actual passenger data from GDSS and applying regression equations to obtain the transportation fuel costs.

Capt Long's research revealed a total cost per passenger for FY97 at $36.63 and $47.08 for FY98 and recommended that DOD should consider instituting a $20.00 per passenger fee for all Space-A travel. It is unknown if DOD or AMC did further research to study the feasibility of instituting a fee.

RAND Report, 2003

RAND completed a study assessing AMC's operations at an aggregate level to better understand the characteristics of peacetime tempo, its potential effects, and alternatives for fixing emerging problems. (Chow, 2003) This study showed that in 1999, Space-A accounted for 65 percent of the passengers on AMC organic flights and 29 percent on AMC-chartered commercial channel flights. Organic missions are considered flights on military aircraft whereas the chartered missions are those flights on commercial airlines. In essence, AMC was paying for the services 'free travel' benefit. The study states that while they agree with this much deserved fringe benefit, that the benefit should be borne by the individual services, not solely by AMC. They proposed two options: Space-A passengers should be charged a fee and in turn, the individual services should reimburse their personnel and dependents who paid the fee or each passenger pay the fee themselves with no reimbursement from the services. It is their belief that AMC is spending millions of dollars per year on this service-wide benefit and that to sustain peacetime operations, a fee structure should be put in place for Space-A travel. (Chow, 2003)

AMC/A4TP Message, 2013

In 2013, AMC/A4TP published a message stating that all Space-A passengers traveling on commercially contracted missions would be required to pay an International

Head Tax fee and Federal Inspection Service fee. The current charges per Space-A passenger are shown below:

Table 4: Space-A Head Tax and Federal Inspection Service Fees (AMC/A4TP, 2013)

Type of Travel	Domestic Head Tax Fee	International Head Tax Fee	Federal Inspection Service Fee
Travel within CONUS (per travel leg)	$3.90	-	-
Travel from overseas to CONUS	-	$17.20	$12.50
Travel to/from AK or HI	$8.60	-	-

The passenger head tax fee is a charge the commercial airlines must pay the Internal Revenue Service and therefore this charge is already imbedded into the government's contracted price for the airlift. The Federal Inspection Service fee is the fee charged for Customs and Immigration and Agriculture and is only charged to those passengers arriving into the U.S. from an overseas location. These fees are monitored by AMC's Passenger Policy Division and are distributed to all passenger terminals when they are updated. There are no fees assessed if traveling Space-A on military (organic) airlift.

Summary

This chapter highlighted the issues surrounding Space-A travel over the last several decades. As early as 1974, there have been concerns over the government costs by providing this 'free' transportation. Despite congressional demands for a fee structure, attempts to institute any type of fee over the years have failed. As of today, there is still no fee structure in place. This may be due to the fact that aside from a 1999

AFIT thesis, there has been no true cost analysis study of the Space-A program. Since the true costs are unknown, then it is difficult to assess a fee. While some progress has been made since Space-A passengers are now required to pay the head tax and FIS fees for commercially contracted missions, this does not cover the additional costs incurred to the government for manpower and fuel. In the next chapter, the manpower costs to process a Space-A passenger as well as the fuel costs to transport them and their baggage are examined.

III. Methodology

Chapter Overview

While the 1993 decision by the Secretary of Defense to cancel the Space-A fees avoided the effort required to implement a uniformed policy for establishing and collecting a fee, it placed the entire burden of financing Space-A travel on DOD (Long, 1999). Although the number of Space-A travelers has decreased since those reports, the costs of providing this service should still be examined due to today's uncertain budget environment. This chapter discusses the methodology of calculating the manpower and fuel costs for the Space-A program.

Manpower Costs

There are many different methods available to account for the manpower costs associated with processing Space-A passengers. This research analyzed the time required to process a Space-A passenger and then multiplied that time by the AMC/A1 (Manpower division) costs of an Airman to compute the manpower costs associated with processing Space-A passengers.

First, it analyzed the passenger processing steps required to process a passenger for a flight. It then differentiated if there were any steps that were exclusive to Space-A travel and accounted for that time. It is important to note that the researcher was unable to analyze every single mission that transported Space-A passengers to determine whether or not Space-R passengers were also on the flight. Due to this limitation, the researcher assumed all missions have at least one Space-R passenger on the flight.

Therefore, this research paper only captured the Space-A manpower costs for those processing steps that are exclusive to Space-A travel regardless of the overall Space-A and Space-R makeup of the flight. For example, passenger service agents in the passenger terminal transported the passengers from the passenger terminal to the aircraft for loading via a shuttle. If a mission had 1 Space-R passenger and 30 Space-A passengers, then even without the Space-A passengers, the passenger service agent would still be required to drive the Space-R passenger out to the aircraft. Therefore, that step is not exclusive to Space-A passengers and was not accounted for in the overall manpower time.

Once those steps exclusive to Space-A travel were determined, a time study was conducted at the Joint Base McGuire Dix Lakehurst Passenger Terminal. Based on all research methods available, a time study was chosen since this research sought to obtain the total time required to process a Space-A passenger. This study was a direct and continuous observation of aerial port personnel processing Space-A passengers, using a stop watch to record the time taken to accomplish this task. It included active duty, retirees, reservists and family members processing in the terminal for Space-A travel.

Using a stopwatch, the processing time ($T_{(i)}$) for each passenger, for each applicable Space-A processing step was captured. Those times were then averaged (for each step) to provide the overall processing time for each step. From there, the average processing time for each step was summed to obtain the total manpower time required to process a Space-A passenger.

$$\boldsymbol{Average\ processing\ time}(\bar{\boldsymbol{T}}_{(\boldsymbol{p})}) = \sum_{\boldsymbol{i=1}}^{\boldsymbol{n}} \bar{\boldsymbol{T}}_{\boldsymbol{\iota}} \dots \bar{\boldsymbol{T}}_{\boldsymbol{n}} \quad \textbf{(1)}$$

Once the total time was determined, that time was multiplied by the AMC/A1 (Manpower division) costs of an Airman for FY11 and FY12. Based on discussions with aerial port supervisors and leaders, the rank of the airman at the passenger processing counter varies from shift to shift and base to base. Therefore, the hourly rate of an Airman First Class, Senior Airman, Staff Sergeant and Technical Sergeant were averaged to obtain the average hourly processing cost.

$$\boldsymbol{Average\ hourly\ manpower\ cost}\ (\bar{\boldsymbol{C}}_{(\boldsymbol{mo})}) = \frac{\sum_{i=1}^{n} \boldsymbol{c_i}}{\boldsymbol{n}} \quad \textbf{(2)}$$

Where: i = pay grade
n = # of pay grades included

Each rank cost is shown to highlight the variances however when calculating overall program costs, the average hourly rate of E-3 to E-6 was used. The manpower cost was then multiplied by the total amount of Space-A passengers that traveled in FY11 and FY12 to obtain the total Space-A manpower costs for the government.

$$\bar{T}_{(p)} * \bar{C}_{(mo)} = \bar{C}_{SA\ (mo)} \quad \textbf{(3)}$$

Where: $\bar{C}_{SA\ (mo)}$ = total Space-A manpower costs

Fuel Costs

Before detailing the fuel cost calculations, it’s important to note that these calculations were only applied to organic aircraft. DOD does not incur additional fuel costs for Space-A passengers on commercially contracted missions since they contract for a specific number of seats and mission routing. If the contractor decides to allow additional passengers (Space-A) to their flight, the additional fuel costs are theirs and do not fall on DOD.

When calculating the fuel costs for organic aircraft, regression equations for the following Mission Design Series (MDS) categories were applied: C-17, C-5A/C, C-5B, C-5M, KC-135, KC-10, C-130H, and C-130J. Regression equations for all other organic airlift are not available and therefore those costs were calculated using the average fuel cost of the eight MDSs listed above. When calculating the extra fuel required to transport Space-A passengers and their bags, there are several factors that must be taken into account that influence the amount of fuel burned during a flight. Winds, total weight of the payload, distance traveled, configuration, airspeed, weather, and altitude are a few examples of these unknown, and largely uncontrollable, variables. While AFPAM 10-1403, Air Mobility Planning Factors, and AFPAM 23-221, Fuel Logistics Planning, provide several key estimates such as fuel burn rates, aircraft block speeds, and aircraft payloads, the actual rates vary according to mission profile, aircraft model, configuration, altitude, airspeed, etc. Rather than trying to account for a host of assumptions as those listed above, this research utilized regression equations developed by AMC/A9 using historic flight data from GDSS, in an attempt to obtain the most accurate fuel cost for transporting Space-A passengers and their bags.

The regression equations were built to describe the relationship between sortie length and cargo weight using historical mission data. The dependent variable is fuel consumption and the independent variables are sortie length (hours), cargo weight (in thousands of pounds), average channel cargo weight, and flight time.

The predicted fuel consumption regression equation is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_1 X_2 + \beta_4 X_1^2 + \beta_5 X_2^2 \qquad \textbf{(4)}$$

Where:
Y = Predicted Fuel Consumption
X_1 = Sortie length (in hours)
X_2 = Average channel cargo weight (in thousands of pounds)
β_0 = intercept
β_1 = flight time coefficient
β_2 = weight coefficient
β_3 = weight x hours coefficient
β_4 = (flight time)^2 coefficient
β_5 = (weight)^2 coefficient

(AMC/A9, 2013)

The predicted fuel consumption regression equation that adjusts for passenger and baggage weights is as follows:

$$\boldsymbol{Y = \beta_0 + \beta_1 X_1 + \beta_2 (X_2 + X_3/1000) + \beta_3 X_1 (X_2 + X_3/1000) + \beta_4 X_1^2 + \beta_5 (X_2 + X_3/1000)^2} \qquad \textbf{(5)}$$

Where:
Y = predicted fuel consumption with pax and baggage weight
X_3 = passenger and baggage weight (in pounds)

(AMC/A9, 2013)

Once the Space-A data from GATES is received from AMC/A4, the flight times from those missions must be obtained from GDSS. Once the flight times are obtained, the regression equations were applied to compute the predicted fuel required without the passenger and baggage weight (Equation 4). A different regression equation was applied to compute the predicted fuel required with the additional passenger and baggage weight provided by GATES (Equation 5). The difference in fuel required for Equation 4 and Equation 5 represents the fuel required to transport those passengers and baggage weight. That number is then converted from pounds to gallons by dividing the difference by 6.767. The result was then multiplied by $3.42 for FY11 and $3.54 for FY12, which represents the price per gallon for fuel as determined by the AMC Fuel Efficiency Office. These steps were repeated for all eight MDSs for FY11 and FY12 and summed to obtain the total Space-A fuel costs. An analytical model of the organic fuel costs ($C_{org\,(f)}$) is shown below:

$$C_{org\,(f)} = \bar{C}_{(f)} * N_{pax} \tag{6}$$

$$\bar{C}_{(f)} = \frac{\sum_{i=1}^{n} \bar{C}_{(fi)}}{n} \tag{7}$$

Where: $\bar{C}_{(f)}$ = average cost of fuel per pax

$\bar{C}_{(fi)}$ = $\bar{C}_{(f)}$ for mds i

n = # of MDS's

$$P_{org\,(f)SA(lbs)} = P_{f(p+b)} - P_f \qquad \textbf{(8)}$$

Where: $P_{org\,(f)SA(lbs)}$ = predicted fuel (lbs) required for Space-A pax & bag wt

$P_{f(p+b)}$ = predicted fuel required for cargo, pax and bag wt

P_f = predicted fuel required for cargo

$$P_{org\,(f)SA(gal)} = \frac{P_{org\,(f)SA(lbs)}}{6.767} \qquad \textbf{(9)}$$

Where: $P_{org\,(f)SA(gal)}$ = predicted fuel (gal) required for Space-A pax & bag wt

$$C_{org\,(f)SA(FY11)} = P_{org\,(f)SA(gal)} * \$3.42 \qquad \textbf{(10)}$$

$$C_{org\,(f)SA(FY12)} = P_{org\,(f)SA(gal)} * \$3.54 \qquad \textbf{(11)}$$

Where: $C_{org\,(f)SA(FY11)}$= fuel cost for Space-A pax & baggage in FY11

$C_{org\,(f)SA(FY12)}$ = fuel cost for Space-A pax & baggage in FY12

Total Space-A Program Costs

This section compiles the data from the manpower and fuel cost estimates. Initially, it will show the cost estimates by FY for commercial airlift and organic airlift. It will then provide the overall program costs to DOD for FY11 and FY12. It will also divide the total number of passengers by the total costs per FY to obtain the cost per passenger. Finally, it will divide the total number of bags by the total costs per FY to obtain the cost per bag. An analytical representation of the Space-A cost per passenger is shown below:

$$C_{program} = C_{org(f)} + C_{program(mo)} \quad \textbf{(12)}$$

Where: $C_{org(f)}$ = organic fuel cost

$C_{program(mo)}$ = manpower costs

$$C_{pax} = \frac{C_{program}}{N_{pax}} \quad \textbf{(13)}$$

Where: C_{pax}= Space-A cost per passenger

$C_{program}$ = total Space-A program cost

N_{pax} = number of Space-A passengers

$$C_{bag} = \frac{C_{program}}{N_{bag}} \quad \textbf{(14)}$$

Where: C_{bag}= Space-A cost per bag

$C_{program}$ = total Space-A program cost

N_{bag} = number of Space-A bags

Summary

This chapter detailed the methodology used to obtain the overall Space-A program costs. As with any cost estimate research, the overall cost estimates are dependent upon the method by which those costs are estimated and therefore may vary from researcher to researcher. However, it is believed that those outlined in this chapter will provide a reasonable estimate of the costs considered.

IV. Analysis and Results

Chapter Overview

This chapter will provide the overall cost estimates for Space-A travel and then apply the methods in Chapter 3 to obtain the overall Space-A program costs.

Overall Statistics

In FY11, DOD transported 1,085,770 passengers on military or commercially contracted airlift. Of those, 16.3% (177, 188) were Space-A passengers. Similarly, in FY12, 895,101 passengers were moved and 21.4% (191,288) were Space-A passengers. The GATES system tracks the Space-A traveler's sponsor service and that information can be found below:

Table 5: FY11 Space-A Sponsor Service

Army	60,620	34.21%
Coast Guard	2,181	1.23%
Air Force	62,942	35.52%
Marines	13,060	7.37%
Navy	35,270	19.91%
Other	3,115	1.76%
Total	177,188	100.00%

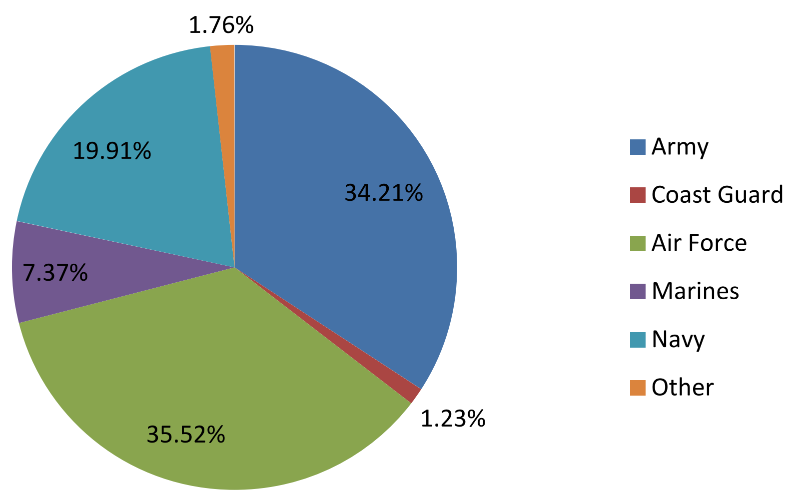
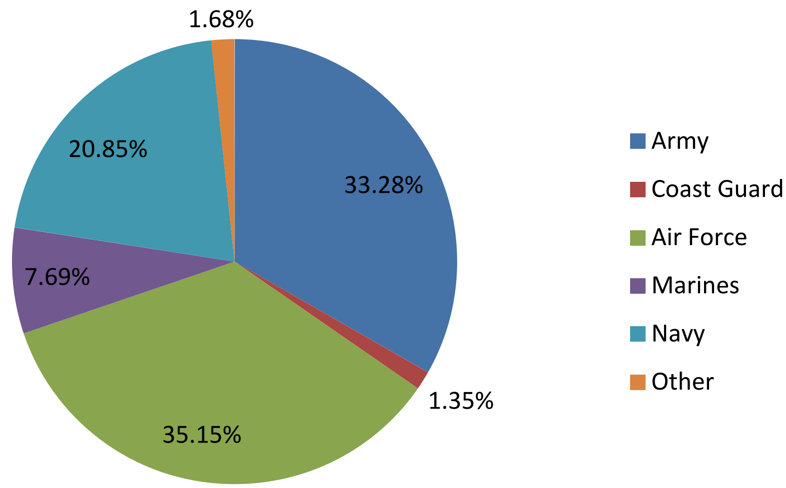


Table 6: FY12 Space-A Traveler Sponsor Service

Army	63,656	33.28%
Coast Guard	2,580	1.35%
Air Force	67,235	35.15%
Marines	14,718	7.69%
Navy	39,882	20.85%
Other	3,217	1.68%
Total	191,288	100.00%



The GATES database also tracks the Category Code that Space-A passenger's travel. While a complete listing can be found in DoD 4515.13-R, a partial list is provided below:

- Category 1: Emergency travel
- Category II: Sponsors on environmental and morale leave (EML) and accompanied family members

- Category III: Members of the uniformed services in an ordinary or re-enlistment leave status and dependents of military members deployed for more than 365 consecutive days

- Category IV: Dependents of military members deployed for more than 120 consecutive days and unaccompanied family members (18 years or older) traveling on EML orders.

- Category V: Unaccompanied Command-sponsored dependents and military personnel traveling on permissive TDY orders for other than house hunting

- Category VI: Retired military members who are issued DD Form 2 and eligible to receive retired or retainer pay and family members (with a valid identification card) of retired members when accompanied by a sponsor

A breakdown of the travel categories for FY11 and FY12 Space-A passengers can be found below:

Table 7: FY11 Space-A Passenger Travel Category

Category I	2,460	1.39%
Category II	22,511	12.70%
Category III	79,516	44.88%
Category IV	12,526	7.07%
Category V	16,306	9.20%
Category VI	43,869	24.76%
Total	177,188	100%

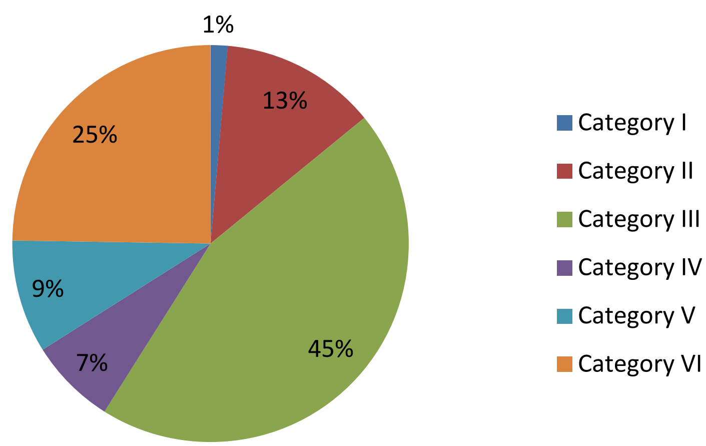
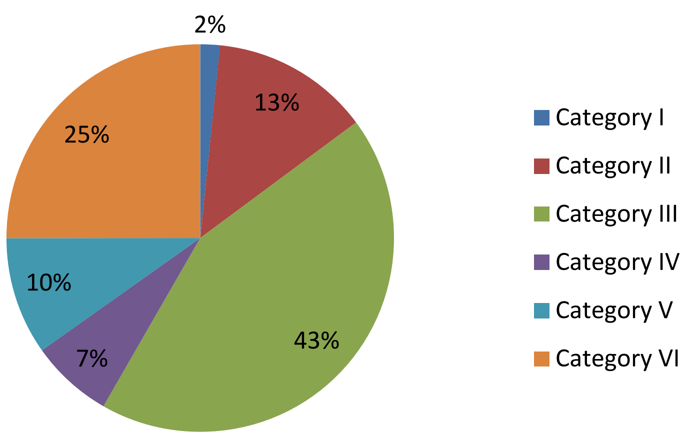


Table 8: FY12 Space-A Passenger Travel Category

Category I	3,139	1.64%
Category II	25,276	13.21%
Category III	83,128	43.46%
Category IV	13,134	6.87%
Category V	18,753	9.80%
Category VI	47,858	25.02%
Total	191,288	100.00%



This data shows that the majority of Space-A travelers are either Air Force or Army and are military members on ordinary leave or dependents of members deployed for 365 days (Category III) or retirees (Category VI). While the overall numbers of Space-A passengers has dropped since earlier reports, DOD still expends money to move these passengers. We will now apply the methodology discussed in Chapter 3 to obtain the fuel and manpower costs associated with Space-A travel.

Manpower Costs

As previously stated, this paper only accounts for the manpower costs to Space-A passengers for those passenger processing steps exclusive to Space-A passengers. The passenger processing steps are as follows:

1. Space A/R registration: determine passenger eligibility
2. Mark passengers present in the system
3. Space-A roll call announcement
4. Call passengers to the counter for selection process
5. Input passenger names into TSA website for clearance (only required for overseas travel) for all passengers
6. Check -in (input data into GATES, print boarding pass, weigh baggage and place on baggage conveyor)
7. Order flight meals (boxed lunches) for passengers
8. Build baggage pallet(s) for all passenger bags and transport baggage pallet to the aircraft once processing is completed
9. Conduct security screening for all passengers and their carry-on baggage (x-ray)
10. Complete manifesting procedures
11. Pick-up and deliver meals to the aircraft
12. Transport passengers to the aircraft

These steps were verified by AMC/A4 to ensure all passenger processing steps were captured. After careful review, Steps 1-6 and 9 are the only steps exclusive to Space-A passengers. All other steps would be required, whether the majority of the passengers are Space-R passengers or there is only one Space-R passenger along with Space-A passengers. However, of those seven steps, three will not be included in the overall Space-A manpower cost. Due to improvements in technology, step 1 can be accomplished on-line at the specific Passenger Terminal website by the passenger anywhere internet is available and therefore is not always a required step by a passenger service agent. Due to this, the time for step 1 will not be included in the manpower costs. The Space-A roll call announcement in step 3 is conducted over the intercom in the passenger terminal and takes approximately :30 seconds. Since this announcement is only made once, the time would have to be divided by each of the Space-A passengers in the terminal. Since each mission has varying numbers of Space-A passengers, this research is unable to attribute a specific time for this step to each passenger. Despite this, it is believed that the omission of step 3 will not affect the overall costs. Additionally, step 5 is only required for overseas missions. This research did not distinguish between CONUS and overseas missions and therefore that time required will not be included in overall costs.

In December 2013, a time study was conducted at the Joint Base McGuire Dix Lakehurst passenger terminal to determine the amount of time required to process a Space-A passenger. Three missions were observed with a total of 46 Space-A passengers. The times for each of those 46 passengers to complete steps 2, 4, 6, and 9 were captured and can be found in Appendix A. The average time to process a Space-A passenger through steps 2, 4, 6, and 9 was 3 minutes and 21 seconds. Since the rank of passenger service agents vary from shift to shift and base to base, the manpower costs of an Airman First Class (E-3), Senior Airman (E-4), Staff Sergeant (E-5) and Technical Sergeant (E-6) are averaged and multiplied by the average processing time. The hourly rates for E-3 through E-6 for FY11 and FY12 were obtained from AMC/A1 and divided by 60 to obtain the per-minute rates of those pay grades. The average time from the time study (3 minutes and 21 seconds or 3.35) was then multiplied by the per-minute costs and the results are shown below:

Table 9: Manpower Costs per Passenger

Pay Grade	Hourly Rate	Minute Rate	Manpower cost per passenger
FY11 E-3	$24.26	$0.40	$1.35
FY11 E-4	$30.49	$0.51	$1.70
FY11 E-5	$36.80	$0.61	$2.05
FY 11 E-6	$43.30	$0.72	$2.42
FY12 E-3	$25.00	$0.42	$1.40
FY12 E-4	$31.50	$0.53	$1.76
FY12 E-5	$38.17	$0.64	$2.13
FY12 E-6	$44.87	$0.75	$2.51

The average manpower cost per passenger for FY11 is $1.88 and $1.95 for FY12. These rates were then multiplied by the total Space-A passengers for FY11 and FY12 to calculate the total Space-A manpower costs shown below.

Table 10: Space-A Manpower Costs

	Space-A Passengers	Per Passenger Cost	Total Space-A Manpower Costs
FY11	177,188	$1.88	$333,113.44
FY12	191,288	$1.95	$373,011.60

Fuel Costs

As previously mentioned, this research only focuses on the additional fuel costs for transporting Space-A passengers on the following aircraft: C-5, C-17, C-130, KC-10 and KC-135. The regression equations as shown in Appendix B were used to estimate each of the eight MDSs for FY11 and FY 12 and the costs are shown below.

C-5

Three different regression equations were used to estimate the C-5: a C-5A/C equation, a C-5B equation and a C-5M equation. The C-5A/C regression equation used 389 observations, the C-5B used 657 observations and the C-5M used 110 observations. All three models had an R square value of .98. The regression equations were used to estimate the FY11 and FY12 data to obtain the predicted fuel costs for the additional weight. The results are below:

Table 11: C-5 Fuel Cost Results

C-5	# of S/A Passengers	Total Weight	Avg Flight Time	Fuel Cost for additional weight	Avg Fuel Cost per passenger
FY11	27,214	4,869,293	7.05	$524,623.21	$19.28
FY12	26,020	4,702,946	7.35	$544,779.40	$22.21

Additional C-5 cost information can be found in Appendix C and the regression statistics can be found in Appendix D.

C-17

The C-17 regression equation used 14,418 observations and had an R squared value of .975. The equation was used to estimate the FY11 and FY12 data to obtain the predicted fuel costs for the additional weight. The results are below:

Table 12: C-17 Fuel Cost Results

C-17	# of S/A Passengers	Total Weight	Avg Flight Time	Fuel Cost for additional weight	Avg Fuel Cost per passenger
FY11	57,281	10,311,342	6.52	$1,140,046.69	$19.90
FY12	55,868	10,266,803	6.22	$1,126,732.65	$20.17

Additional C-17 cost information found in Appendix E and the regression statistics can be found in Appendix F.

C-130

Two different regression equations were used to estimate the C-130: a C-130E/H equation and a C-130J equation. The C-130E/H equation used 853 observations and had an R square value of .969. The C-130J equation used 565 observations and had an R square value of .948. The C-130 regression equations were used to estimate the FY11 and FY12 data to obtain the predicted fuel costs for the additional weight. The results are below:

Table 13: C-130 Fuel Cost Results

C-130	# of S/A Passengers	Total Weight	Avg Flight Time	Fuel Cost for additional weight	Avg Fuel Cost per passenger
FY11	4,410	815,758	3.95	$18,862.56	$4.28
FY12	4,071	732,295	4.09	$19,127.98	$4.70

There is a significant difference in the fuel costs for the C-130 as compared to the other MDSs. This is due to the fuel burn rate and the shorter sortie durations. According to AMCI 10-202V4, CL-1 the C-130 fuel burn rate is 4,500 pounds per hour (AMC, 2006). On the other hand, the C-17 fuel burn rate is 15,000 pounds per hour and the C-5 fuel burn rate is 24,000 pounds per hour (AMC, 2006). Since the C-130 burns less fuel, the cost to move passengers would be less than the other cargo aircraft. Also, the C-130 sorties are shorter than the other cargo sorties with the average sortie length of four hours. The shorter flight times coupled with the lower fuel burn rate drives the average fuel cost per passenger to be approximately one-fourth the total of the other cargo aircraft. This cost difference affects the overall Space-A program price per passenger by approximately $2.00. Since the cost difference is minimal, a weighted analysis was not conducted. Additional C-130 cost information can be found in Appendix G and the regression statistics can be found in Appendix H.

KC-10

The KC-10 regression equation used 412 observations and had an R square value of .990. The regression equation was used to estimate the FY11 and FY12 data to obtain the predicted fuel costs for the additional weight. The results are below:

Table 14: KC-10 Fuel Cost Results

KC-10	# of S/A Passengers	Total Weight	Avg Flight Time	Fuel Cost for additional weight	Avg Fuel Cost per passenger
FY11	6,814	1,206,464	6.26	$152,425.64	$22.37
FY12	6,299	1,147,688	6.45	$153,548.10	$24.38

Additional KC-10 cost information can be found in Appendix I and the regression statistics can be found in Appendix J.

KC-135

The KC-135 regression equation used 317 observations and had an R square value of .963. The regression equation was used to estimate the FY11 and FY12 data to obtain the predicted fuel costs for the additional weight. The results are below:

Table 15: KC-135 Fuel Cost Results

KC-135	# of S/A Passengers	Total Weight	Avg Flight Time	Fuel Cost for additional weight	Avg Fuel Cost per passenger
FY11	10,933	1,956,848	6.55	$215,246.22	$22.37
FY12	9,610	1,705,257	6.43	$193,486.31	$20.13

Additional KC-135 cost information can be found in Appendix K and the regression statistics can be found in Appendix L.

Other Organic Airlift

Regression equations weren't developed for the remainder of the organic aircraft that moved Space-A passengers such as C-9's, C-12's, C-21s', etc. Therefore, the average fuel cost from the 5 MDS's mentioned earlier in this chapter was multiplied by the number of Space-A passengers that traveled on the remainder of the organic aircraft. For FY11, the average fuel price was calculated as $18.71 by averaging the C-5, C-17, C-130, KC-10 and KC-135 average fuel costs. That average fuel cost was then multiplied by 8,420, which represents the number of Space-A passengers, to obtain the total fuel cost as $157,578.19. For FY12, the average fuel price was calculated as $18.99 which was then multiplied by 9,168 (number of Space-A passengers) to obtain the total fuel cost as $174,057.33. The total fuel costs for the remainder of the organic airlift are shown below:

Table 16: Other Organic Airlift Fuel Costs

Other Organic Airlift Costs	**FY11**	**FY12**
# of S/A Passengers	8,420	9,168
S/A Passenger Weight	1,286,422	1,414,377
# of Bags	7,731	8,182
Baggage Weight	232,597	248,959
Total Weight	1,519,019	1,663,336
Avg Fuel Cost	$18.71	$18.99
Fuel Cost for Additional Weight	$157,538.20	$174,100.32

Total Space-A Program Costs

Commercially contracted airlift transported approximately 33% of the Space-A travelers in FY11 and 39% in FY12. Since any additional fuel costs incurred for their transportation fall on the contractor, the total Space-A costs for commercial airlift only includes manpower costs. Therefore, the total passengers were multiplied by $1.88 for FY11 and $1.95 for FY12 to obtain the overall costs shown below:

Table 17: Space-A Commercial Airlift Costs

	FY11	**FY12**
Passengers	58,901	74,791
Overall Costs	$110,733.88	$145,842.45

Organic airlift transported approximately 67% of the Space-A travelers in FY11 and 61% in FY12. The organic airlift costs include the manpower costs by applying the

$1.88 and $1.95 for FY11 and FY12 as well as the fuel costs that were calculated by applying the regression equations mentioned in Chapter 3. The overall costs for Space-A travelers on organic airlift are below:

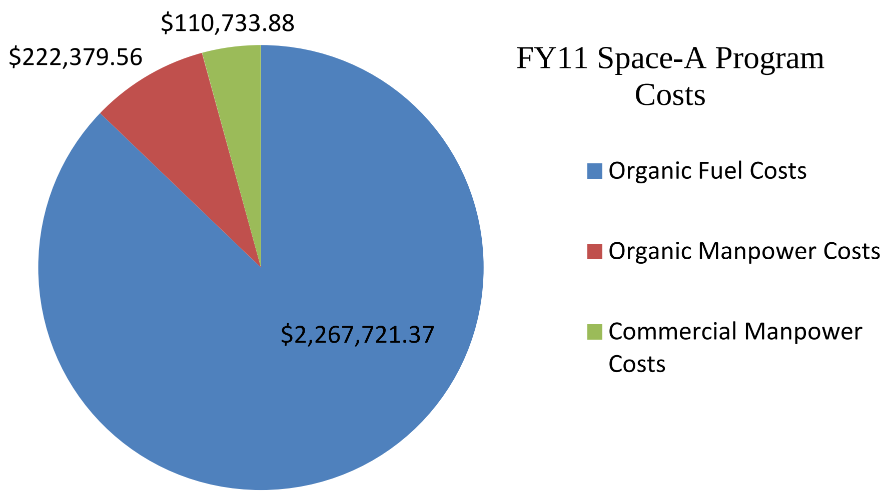
Table 18: Space-A Organic Airlift Costs

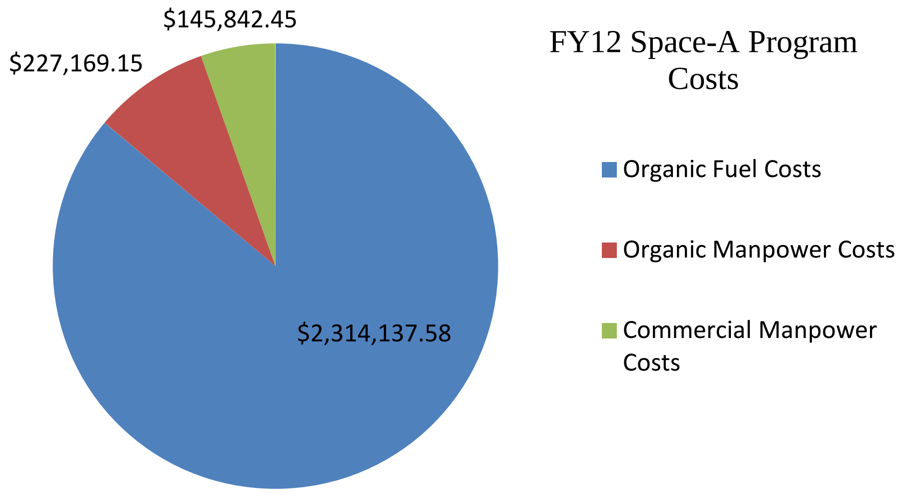
	FY11	FY12
Passengers	118,287	116,497
Manpower Costs	$222,379.56	$227,169.15
Fuel Costs	$2,267,721.37	$2,314,137.58
Overall Costs	$2,490,100.93	$2,541,306.73

Therefore, the overall fuel and manpower Space-A program costs to DOD for FY11 and FY12 are as follows:

Table 19: Space-A Fuel and Manpower Costs

	FY11	FY12
Organic Fuel Costs	$2,267,721.37	$2,314,137.58
Organic Manpower Costs	$222,379.56	$227,169.15
Commercial Manpower Costs	$110,733.88	$145,842.45
Total	$2,600,834.81	$2,687,149.18





The research presents two ways of breaking down the costs: first, a per passenger cost and then second, a per bag cost. The Space-A per passenger costs can be found by dividing the overall costs by the number of passengers, as shown below:

Table 20: Space-A per Passenger Costs

	FY11	FY12
Total Space-A Passengers	177,188	191,288
Overall Costs	$2,600,834.81	$2,687,149.18
Per Passenger Cost	$14.68	$14.05

Whereas, the per baggage cost is found by dividing the overall costs by the number of bags, as shown below:

Table 21: Space-A per Bag Cost

	FY11	FY12
Total Space-A Baggage	124,812	120,471
Overall Costs	$2,600,834.81	$2,687,149.18
Per Bag Cost	$20.84	$22.31

Investigative Questions Answered

The questions that this research was seeking to answer were the following:

1. How many passengers traveled Space-A in 2011? In 2012?

Table 22: FY11 and FY12 Space-A Passengers

	FY11	FY12
Space-A Passengers	177,188	191,288

2. What were the weights of the Space-A passengers that traveled in 2011? In 2012?

Table 23: FY11 and FY12 Space-A Passenger Weight

	FY11	FY12
Organic Airlift Passenger Weight (lbs)	17,131,787	17,208,628
Commercial Airlift Passenger Weight (lbs)	8,990,212	11,539,347
Total Space-A Passenger weight (lbs)	26,121,999	28,747,975

3. What were the baggage weights for the Space-A passengers that traveled in 2011? In 2012?

Table 24: FY11 and FY12 Space-A Baggage Weight

	FY11	FY12
Organic Airlift Baggage Weight (lbs)	4,124,066	3,981,595
Commercial Airlift Baggage Weight (lbs)	2,249,820	2,811,560
Total Space-A Baggage weight (lbs)	6,373,886	6,793,155

4. What are the manpower costs to process a Space-A passenger?

Table 25: Space-A Manpower Costs

	Space-A Passengers	Per Passenger Cost	Total Space-A Manpower Costs
FY11	177,188	$1.88	$333,113.44
FY12	191,288	$1.95	$373,011.60

5. What are the fuel costs to transport a Space-A passenger and their bag(s)?

Table 26: FY11 and FY12 Fuel Costs

	FY11	FY12
Fuel Costs	$2,267,721.37	$2,314,137.58

Once this data was captured and analyzed, the following questions were answered:

6. What is the total cost of the Space-A program?

Table 27: Space-A Program Cost

	FY11	FY12
Space-A Program Costs	$2,600,834.81	$2,687,149.18

7. What are the Space-A per passenger costs?

Table 28: Space-A per Passenger Cost

	FY11	FY12
Total Space-A Passengers	177,188	191,288
Overall Costs	$2,600,834.81	$2,687,149.18
Per Passenger Cost	$14.68	$14.05

8. What are the Space-A per baggage costs?

Table 29: Space-A per Bag Cost

	FY11	**FY12**
Total Space-A Baggage	124,812	120,471
Overall Costs	$2,600,834.81	$2,687,149.18
Per Bag Cost	$20.84	$22.31

Summary

The overall Space-A program costs are significantly lower than previous studies due to the methodology applied. As mentioned previously, the use of planning factors found in Air Force publications requires the researcher to assume many unknown variables, such as airspeed, weather and altitude. By applying actual mission and passenger data from GATES into the regression equations, it takes into account all those variables when determining the additional fuel required and therefore the costs are more accurate.

Another reason for the significant cost differences is due to the manpower calculations. While it may seem logical to attribute manpower authorizations against Space-A passenger movement as Capt Long did, it isn't necessarily realistic. Not only does it inflate the manpower costs, it also doesn't take into account other duties and responsibilities of those Airmen. Instead, conducting a time study to obtain the time that passenger service agents actually spend on processing Space-A passengers provides a much more accurate estimate of the manpower costs. It is with the use of this empirical data that the manpower required to support this benefit can be shown.

Previous research has only used assumptions and estimations and therefore produced grossly overstated costs of the Space-A program to the government. Instead, the use of regression equations coupled with a manpower time study provides accurate costs that are directly linked to this program. This research should be much more valuable to senior leadership as it provides an accurate picture of the total Space-A program costs. The next chapter will examine some Space-A program options for senior leadership as we move forward in this budget constrained environment.

V. Conclusions and Recommendations

Chapter Overview

This chapter summarizes the research results from the previous chapters and provides recommendations for consideration of implementing a Space-A fee. Additionally, it provides recommendations for future research.

Conclusions of Research

The intent of this research was to quantify the costs of Space-A travel. This research applied a reasonable cost-estimating model to FY11 and FY12 Space-A travel data and provided an approximation of the manpower and fuel costs that DOD pays annually. While many believe that Space-A travel is free, this paper highlights just the opposite. While it may be free to the passenger, it certainly isn't free to the government. As shown in Chapter 4, DOD expends approximately $2,600,000 annually on this program.

In a fiscally constrained environment, it's necessary to monitor, control and adjust expenditures of all programs in order to best utilize the funds available. This is a substantial amount of money that isn't programmed for during the annual Program Objective Memorandum. Instead, these funds are diverted from other programs. However, now that the costs are known, senior leadership may decide to look for ways to recoup some of this money.

Significance of Research

There is an old management adage that states, “You can’t manage what you don’t measure.” (Reh, 2014) The last known research on this topic was completed in 1999 and applied many assumptions to the planning estimates provided in Air Force publications. The difference in methodologies applied is evident in the overall Space-A fuel and manpower costs as shown in this paper. For example, the 1999 research calculated the overall Space-A program costs at $16,000,000 while this research determined that DOD expends approximately $2,600,000 per year on this program. The cost differences are due to this research applying regression equations to determine more accurate fuel costs as well as applying a completely different cost model used for the manpower portion. This research also determined that the per passenger cost is approximately $14.00-$15.00. This is significantly lower than the 1991 DOD/IG estimate of $32.00 and the 1999 AFIT thesis estimate of $41.86. And finally, this research is significant because it calculates a per baggage cost that hasn’t been provided in previous studies.

As stated in Chapter 1, the infrastructure and equipment costs were not factored into the total Space-A program costs in this research paper. Therefore, the cost of $2.6 million dollars per year should be considered the lower bound (minimum) costs that DOD expends annually. The inclusion of those other variables will be sure to show an increase in the costs to the government. However, the estimate provided in this research paper still provides a good baseline to look for cost savings in this program.

Recommendations for Action

There are several recommendations for action based on this research. The first option is to change nothing and to continue the program as-is and allow DOD to continue to incur the costs. Another option, at the other end of the spectrum, would be to discontinue the Space-A program. This would save the government approximately $2,600,000 annually however, it would certainly be an unpopular decision for members that use Space-A travel.

Two other options would be to charge a nominal fee based on either a per passenger cost or a per baggage cost. Since the cost per person detailed in Chapter 4 doesn't include the infrastructure and equipment costs, it wouldn't be inappropriate to charge $15.00 per person. The $15.00 per passenger charge would recoup 100 percent of the manpower and fuel costs and therefore only leave the infrastructure and equipment costs for the government. Another option is to institute a per baggage fee rather than a per passenger fee. This fee could be $20.00 should be approximately $20.00 per bag, similar to the civilian airlines. If the $20.00 per bag fee was charged in FY12, 90% of the fuel and manpower costs would have been recovered.

While instituting a Space-A travel fee would probably be an unpopular decision it may be necessary in today's fiscally constrained environment. This research merely provides the facts of the costs of Space-A travel to the government. However, as stated in the 1999 paper, "determining the value that members place on the Space-A privilege should be considered when deciding whether or not to implement a fee for its use" (Long, 1999). However, it may be found that passengers would be willing to pay the Space-A fee to ensure the continuation of this service as long as they believe the fee to be reasonable.

Recommendations for Future Research

The fully burdened cost of Space-A travel includes manpower, fuel, infrastructure and the equipment required to transport Space-A passengers. This research only analyzes the fuel and manpower costs, therefore the overall Space-A costs detailed in Chapter 4 represents the lower bound of the costs. There is certainly additional research that can be conducted to possibly pinpoint the entire Space-A program costs. This additional research could include analyzing the breakdown of Space-A and Space-R passengers on each flight to accurately account for the manpower costs. For example, due to time constraints and data available, this paper assumed that there was at least one Space-R passenger on every flight thereby excluding many of the processing steps (and therefore costs) that could ultimately be associated with Space-A passenger movement. Another research opportunity would be to obtain the infrastructure and equipment costs and determine a way to assign some of the costs to Space-A travelers since both are required to process Space-A passengers. Additional research could analyze assigning different costs for those travelers flying within CONUS or OCONUS versus those flying CONUS to OCONUS (or vice-versa). This research could also investigate assigning costs based on distance flown rather than a standard one price per person. Finally, a survey or questionnaire could be conducted of Space-A passengers to measure the acceptance of a Space-A fee in the future.

Summary

This research has provided Space-A fuel and manpower costs that are more accurate than previous studies due to the methodologies applied. With this data, senior leadership can decide whether or not this program is worth the money expended on it annually. Options were provided that could recoup some of the monies expended. However, senior leaders may decide that in an environment like today where it seems that more and more benefits and services are being discontinued due to the budget, that maybe this isn't the best time to implement a Space-A fee. And if that's the case, then the methodologies described in this paper can be applied again in the future for different FY data in case this subject is revisited.

Appendix A: Manpower Time Study

Time Study	Total Processing Time		Time Study	Total Processing Time
Passenger 1	3:55		Passenger 24	5:11
Passenger 2	3:19		Passenger 25	4:58
Passenger 3	3:05		Passenger 26	3:44
Passenger 4	3:25		Passenger 27	3:44
Passenger 5	3:31		Passenger 28	2:48
Passenger 6	4:21		Passenger 29	2:52
Passenger 7	4:27		Passenger 30	2:55
Passenger 8	3:15		Passenger 31	2:35
Passenger 9	2:51		Passenger 32	2:57
Passenger 10	2:51		Passenger 33	3:38
Passenger 11	2:20		Passenger 34	3:26
Passenger 12	2:30		Passenger 35	3:25
Passenger 13	2:19		Passenger 36	2:30
Passenger 14	2:51		Passenger 37	2:26
Passenger 15	3:29		Passenger 38	3:00
Passenger 16	4:28		Passenger 39	2:55
Passenger 17	4:26		Passenger 40	2:50
Passenger 18	3:42		Passenger 41	2:46
Passenger 19	3:17		Passenger 42	2:31
Passenger 20	3:17		Passenger 43	3:40
Passenger 21	3:02		Passenger 44	2:39
Passenger 22	4:32		Passenger 45	3:36
Passenger 23	4:44		Passenger 46	3:11

Appendix B: Regression Equation Coefficients

Coef (β1)	Wt Coef (β2)	Wt*Flt Time Coef (β3)	Flt Time^2
527630	105.2180202	52.4965082	37.79
941755	124.2501473	37.3799101	92.14
394770	-16.4132395	17.0177159	-70.76
135699	10.3340327	13.2983309	-16.98
000000	-56.1787000	30.4345108	359.61
084877	59.5688238	29.8339609	58.98
196976	-13.0402679	38.8337091	95.89
807170	25.7924781	33.8847320	218.47

Appendix C: FY11 & FY12 C-5 Costs

FY11 C-5 Costs

# of S/A Passengers	27,214
S/A Passenger Weight	3,905,459
# of Bags	28,474
Baggage Weight	963,834
Total Weight	4,869,293
Avg Passenger Weight	143.51
Avg Baggage Weight	33.85
Avg Flight Time	7.05
Fuel Cost for additional weight	$524,623.21
Avg Fuel Cost per passenger	$19.28

FY12 C-5 Costs

# of S/A Passengers	26,020
S/A Passenger Weight	3,760,309
# of Bags	27,772
Baggage Weight	942,637
Total Weight	4,702,946
Avg Passenger Weight	144.52
Avg Baggage Weight	33.94
Avg Flight Time	7.35
Fuel Cost for additional weight	$544,779.40
Avg Fuel Cost per passenger	$20.94

Appendix D: Regression Statistics for the C-5

Regression Statistics for the C-5A/C Model

Multiple R	0.994
R Square	0.987
Adjusted R Square	0.987
Standard Error	7733.011
Observations	389

Regression Statistics for the C-5B Model

Multiple R	0.992
R Square	0.984
Adjusted R Square	0.984
Standard Error	9121.737
Observations	657

Regression Statistics for the C-5M Model

Multiple R	0.991
R Square	0.981
Adjusted R Square	0.980
Standard Error	9801.075
Observations	110

Appendix E: FY11 & FY12 C-17 Costs

FY11 C-17 Costs

# of S/A Passengers	57,281
S/A Passenger Weight	8,273,967
# of Bags	61,270
Baggage Weight	2,037,375
Total Weight	10,311,342
Avg Passenger Weight	144.45
Avg Baggage Weight	33.25
Avg Flight Time	6.52
Fuel Cost for additional weight	$1,140,046.69
Avg Fuel Cost per passenger	$19.90

FY12 C-17 Costs

# of S/A Passengers	55,868
S/A Passenger Weight	8,322,534
# of Bags	58,753
Baggage Weight	1,944,269
Total Weight	10,266,803
Avg Passenger Weight	148.97
Avg Baggage Weight	33.09
Avg Flight Time	6.22
Fuel Cost for additional weight	$1,126,732.65
Avg Fuel Cost	$20.17

Appendix F: Regression Statistics for the C-17

Regression Statistics for the C-17 Model

Multiple R	0.987
R Square	0.975
Adjusted R Square	0.977
Standard Error	6635.314
Observations	14,418

Appendix G: FY11 & FY12 C-130 Costs

FY11 C-130 Costs

# of S/A Passengers	4,410
S/A Passenger Weight	670,877
# of Bags	4,462
Baggage Weight	144,881
Total Weight	815,758
Avg Passenger Weight	152.13
Avg Baggage Weight	32.47
Avg Flight Time	3.95
Fuel Cost for additional weight	$18,862.56
Avg Fuel Cost per passenger	$4.28

FY12 C-130 Costs

# of S/A Passengers	4,071
S/A Passenger Weight	612,261
# of Bags	3,769
Baggage Weight	120,034
Total Weight	732,295
Avg Passenger Weight	150.40
Avg Baggage Weight	31.85
Avg Flight Time	4.09
Fuel Cost for additional weight	$19,127.98
Avg Fuel Cost per passenger	$4.70

Appendix H: Regression Statistics for the C-130

Regression Statistics for the C-130E/H Models

Multiple R	0.985
R Square	0.969
Adjusted R Square	0.969
Standard Error	1237.527
Observations	853

Regression Statistics for the C-130J Model

Multiple R	0.973
R Square	0.948
Adjusted R Square	0.947
Standard Error	1683.777
Observations	565

Appendix I: FY11 & FY12 KC-10 Costs

FY11 KC-10 Costs

# of S/A Passengers	6,814
S/A Passenger Weight	971,496
# of Bags	7,177
Baggage Weight	234,968
Total Weight	1,206,464
Avg Passenger Weight	142.57
Avg Baggage Weight	32.74
Avg Flight Time	6.26
Fuel Cost for additional weight	$152,425.64
Avg Fuel Cost per passenger	$22.37

FY12 KC-10 Costs

# of S/A Passengers	6,299
S/A Passenger Weight	922,872
# of Bags	6,744
Baggage Weight	224,816
Total Weight	1,147,688
Avg Passenger Weight	146.51
Avg Baggage Weight	33.34
Avg Flight Time	6.45
Fuel Cost for additional weight	$153,548.10
Avg Fuel Cost per passenger	$24.38

Appendix J: Regression Statistics for the KC-10

Regression Statistics for the KC-10 Model

Multiple R	0.995
R Square	0.990
Adjusted R Square	0.990
Standard Error	4839.365
Observations	412

Appendix K: FY11 & FY12 KC-135 Costs

FY11 KC-135 Costs

# of S/A Passengers	10,933
S/A Passenger Weight	1,547,717
# of Bags	12,532
Baggage Weight	409,131
Total Weight	1,956,848
Avg Passenger Weight	141.56
Avg Baggage Weight	32.65
Avg Flight Time	6.55
Fuel Cost for additional weight	$215,246.22
Avg Fuel Cost per passenger	$21.34

FY12 KC-135 Costs

# of S/A Passengers	9,610
S/A Passenger Weight	1,379,780
# of Bags	9,870
Baggage Weight	325,477
Total Weight	1,705,257
Avg Passenger Weight	143.58
Avg Baggage Weight	32.98
Avg Flight Time	6.43
Fuel Cost for additional weight	$193,486.31
Avg Fuel Cost per passenger	$20.13

Appendix L: Regression Statistics for the KC-135

Regression Statistics for the KC-135R/T

Multiple R	0.981
R Square	0.963
Adjusted R Square	0.962
Standard Error	4836.175
Observations	317

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Vita

Major Karen P. Rupp enlisted in the Air Force as a Non-Destructive Inspection Technician in June of 1992, and her first assignment was Eglin AFB, FL. After two years, she was reassigned to Aviano AB, Italy where she worked on the F-16 aircraft as well as numerous other aircraft during Operation DENY FLIGHT. In 1997, she was reassigned to Shaw AFB, SC and later completed her Bachelor of Arts in Interdisciplinary Studies with a major in criminal justice and a minor in psychology and sociology through the University of South Carolina. She was commissioned through Officer Training School in August of 2001.

Over the last thirteen years, Maj Rupp has completed several squadron, wing and Numbered Air Force-level assignments. In 2010 she was selected for the Education with Industry program with Boeing in St. Louis, MO. After completing this career broadening assignment, she was reassigned to Headquarters Air Force as a programmer for the A4/7 directorate. In May 2013, she entered the Advanced Study of Air Mobility program as an Intermediate Developmental Education student. Upon graduation, Major Rupp will be assigned as the 375th Logistics Readiness Squadron Commander, Scott AFB, IL.

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14. ABSTRACT The intent of this research was to determine the cost of Space Available travel to the government. In 1999, an AFIT thesis documented that the government spent approximately $30 million on processing and transporting Space Available passengers in FY97 and FY98. However, due to different methodologies applied, it is believed that this paper presents a more accurate cost analysis of the Space Available program. This research calculated the manpower and fuel costs required to process and transport Space Available passengers. A time study was conducted to obtain the time required of a passenger service agent to process a passenger through the passenger terminal. Regression equations were applied for the five most commonly used organic airlift used for Space Available travel to obtain the fuel costs. Once those costs were calculated, an overall Space Available program cost was determined as well as a cost per passenger and a cost per bag. Overall, the government spends approximately $2.6 million annually to operate the Space Available program. This research recommends instituting a fee, either per passenger or per bag, to help recoup some of the monies expended as we move forward in a budget constrained environment.			
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